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(19)(CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Device Suitable for Use in Conjunction with Passenger Cars Fitted with UIC-Approved Traction-and-Buffing Devices, and with General Application to All Passenger Cars

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Device suitable for use in conjunction with passenger cars fitted with UIC-approved traction-and-buffing devices, and with general application to all passenger cars.

The present invention relates to a device suitable for use both on passenger cars possessing UIC-compatible traction-and-buffing gear and floating gangways that slide against each other, and moreover relates to passenger cars in general.

Although a number of passenger car gangway systems are already known, their use has proven less than satisfactory, since the passenger is exposed to the weather while traversing such device. Moreover, high-intensity pressure shocks arising during high speed train passing and tunnel running are permitted to propagate, unchecked, into the insides of the rail car.

In order to alleviate at least somewhat such disadvantages, GB-PS 964 210, for example, has disclosed a gangway which, being fitted to the end of the car body, presses at the top by means of elastic elements against the corresponding gangway of the other coupling car, and at the bottom presses with its buffer against the buffer of the other vehicle.

When such gangways meet, their end frames in response to horizontal and vertical movement, ride relatively stiffly in relation to the end of the car body to which they are attached; thus the horizontal and vertical relative motions occurring between two coupled cars are absorbed exclusively by the sliding together of both gangway end frames.

This arrangement implies a more or less significant reduction in the free passage clearance existing in the gangway every time the car bodies move laterally relative to each other.

Continuing relative side-to-side shifting of both gangway parts give the passenger crossing between the cars a feeling of insecurity.

An additional requirement of high speed rail travel is that of designing such shock wave-attenuating gangways to be UIC-compatible, and therefore, capable of being fitted to passenger cars possessing on both ends flexible traction-and-buffing gear comprising one screw coupling and two side buffers, such an arrangement requiring that the buffers of two coupling rail cars meet in such a way that their heads are able to meet head-on.

The colliding, as described in the previous example, of gangway end frames, caused by the buffing force, is not permitted.

Rather, such shock wave-attenuating and UIC-compatible gangways have to make room for the traction-and-buffing gear and so leave a "Berne Clearance" required by international railroading regulations governing coupling and decoupling.

DE-OS 35 05 762 and DE-OS 34 30 112 disclose gangways which, in addition to addressing the requirements of modern high speed rail travel, can be fitted to UIC-approved equipment.

In this arrangement, the gangway is attached and guided on each end of the car body in such a way that the UIC traction-and-buffing devices do not meet tangentially and the Berne Clearance, which is required for safe coupling and decoupling, is unobstructed. The end frames of the gangways of two coupling rail vehicles are held together by means of flexible elements in such a way as to attenuate shock waves, even in the event of lateral relative car shifting occurring during S-curve running.

If the rail cars shift laterally relative to each other past a point normally defined by a stop, which may, for example occur during the very wide lateral movements occurring in stations or sorting yards, the transverse travel of the floating end frames reaches its limit, whereupon the end frames of both gangway parts begin to slide relative to each other in the transverse direction.

Since the floating arrangement of the flexible gangways permit, during such exaggerated lateral shifting, only limited automatic return to a normal position, centering means are provided, which, when both gangway parts shift past a certain point, serve to return the latter to a position in which such parts substantially align. Recent experience, however, has demonstrated that the amount of time during which two gangway parts are separated during curve running, is determined not only by longitudinal pressure forces and the frictional coefficients of the engaging slip surfaces, but also by factors such as the amount of dirt present in the mechanism and weather conditions. Consequently, active centering means are required to ensure a rapid re-centering response.

The object of the present invention is the development of a device that can be fitted to inter-car gangways of the type first disclosed which, by functioning under tension, serves to actively centre both gangway parts, whereby the latter are forced back from offset position into one wherein both parts align congruently during curve running for as long a period as possible, a condition enabled because the proposed device holds both gangway parts in a floating position between two car body ends.

According to one aspect of the invention there is provided a device suitable for use in conjunction with UIC-approved traction-and-buffing devices and floatably-mounted gangway parts that slide against each other, said device comprising active retaining-and-centering means.

In the disclosure to follow, the general principles of the present invention as well as a number of advantageous embodiments of the invention will be described in greater detail with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view illustrating the principles of a proposed retaining-and-centering device as fitted to a gangway part;

Fig. 2 is a plan view of the proposed retaining-and-centering device as fitted to the two parts of a gangway;

Fig. 3 is a view similar to Fig. 2 illustrating the proposed device in which, however, both car body ends have shifted relative to each other;

Fig.4 is a view similar to Fig. 2 illustrating the proposed device in which, however, both rail car ends have shifted the maximum distance relative to each other and whereby both gangway halves slide along each other; and

Figs. 5 to 12 are perspective and cross-sectional views illustrating further design variations of a proposed retaining and centering device.

Fig. 1 illustrates a gangway part 22 fitted with a proposed retaining-and-centering device 1. In this arrangement, a catch 11, 12 is arranged, torsionally-secure, on either side, for example, of the upper zone of a gangway part 22, and is slidably borne in a guide 15, 16 whose length, corresponding to at least the length of the transverse travel path of the end frame of the gangway as indicated in Fig. 4, is attached to gangway part 22. Both catches 11, 12 of centering mechanism 1, which is fitted to gangway part 22, are connected

together via elastic means 4 and transmission means 5, which are also attached to gangway part 22.

Elastic means 4 can, alternatively, be prestressed mechanical draw springs, pneumatic springs, or an elastic element that can be actuated by a fluid employed as the energy transfer medium. Serving as transmission means 5 can be chain or cable as well as flex-ball cable that connect, under tension, elastic means 4 to catches 11, 12.

The principle upon which a proposed retaining-and-centering device 1,1' functions is described more fully by means of Figs 2 to 4.

Fig. 2 is a plan view of a gangway 21, both of whose gangway parts 22,22' are provided with a retaining and centering mechanism 1,1'. In the position shown, longitudinal planes of symmetry 30 and 31 of both car body ends 20,21 align with the longitudinal medial plane 32 of gangway 21, a condition that can be expected in straight track running. Each of catches 11, 12 and 11,' 12', which face each other in mirror-inverted fashion, is held, by means of elastic means 4,4' and transmission means 5,5', either directly against or at a slight distance from the side of the respective gangway part 22 or 22'.

In Fig. 3, longitudinal planes of symmetry 30 and 31 of both car body ends 20, 20' are laterally offset from each other, as could be expected during curve running on open track. Lateral shifting of both car body ends 20,20' relative to gangway 21 continuing up to a limit defined by a stop 25,25', is absorbed by flexible elements 3,3' and external sealing membranes 2,2'. Up to such lateral motion stop, floating gangway 21 does not separate; gangway parts 22,22' face each other consequently as is evidenced by the indicated common longitudinal medial plane 32.

Retaining-and-centering devices 1,1' do not move in this example, whereby catches 11,12 and 11',12', which face each other in mirror-inverted fashion, are held directly or indirectly by means of elastic means 4,4' and transmission means 5,5 against the edge of the respective gangway part 22,22'.

In Fig. 4, longitudinal planes of symmetry 30 and 31 of both car body ends 20,20' are shifted the maximum lateral distance relative to each other, which exceeds that delimited by stops 25,25'. Such pronounced lateral shifting occurs between car body ends during S-shaped running over widely-deviating turnouts. Because flexible elements 3,3' and external sealing membranes 2,2' have both reached the limit of their lateral travel, both gangway parts 22,22' move out of alignment to slide against each other along their gliding surfaces 22,27', as indicated by the offset disposition of their longitudinal planes of symmetry 32,32'. At this point, retaining-and-centering devices 1,1' are automatically actuated, whereby each of catches 11, 12' is slid laterally into its terminal position, while both catches 11',12 are pulled, against the resistance of elastic means 4,4', away from guides 15', 16 by a distance corresponding to the transverse travel path of gangway parts 22,22'.

When both car body ends 20,20' slide back toward the centre, gangway parts 22,22' are, under the influence of elastic means 4,4' and transmission means 5,5', which engage both the former and the latter, brought back into an aligned position corresponding to the resting position of retaining-and-centering device 1,1'.

If both car body ends 20,20' shift again through the maximum distance in the opposite transverse direction, retaining-and-centering devices 1,1' operate in reverse; catches 11', 12 are carried back into their resting positions while catches 11,12' are pulled against the resistance of elastic means 4,4' away

from guides 15, 16' through a distance corresponding to the transverse path travelled by gangway parts 22,22'. Should different axle loads in car bodies 20,20' cause height differences to exist when gangway parts 22,22' are sliding relatively, the degree of overlap of catches 11,11' and 12,12' is sufficient to ensure proper re-centering of the gangways following pronounced lateral shifting.

The difference in elastic tension existing between flexible elements 3,3' of the mounting of gangway parts 22,22' and retaining-and-centering device 1,1' serves to effectively maintain, for long periods during curve running, free passage clearance in gangway 21 with the exception perhaps of running over very tight shunting yard curves. Thus, retaining-and-centering device 1,1', which is quite stiff, in concert with the more yielding elements 3,3', serve both to maintain for fairly long periods during curve running, gangway 21 in its floating position and to efficiently re-center laterally-offset gangway parts 22,22' following traversal of very tight curves.

Further advantageous embodiments of a proposed retaining-and-centering device are described in Figs. 5 to 12.

Figure 5 illustrates a gangway part 22 comprising a retaining-and-centering device 125 which, comprising posts 9, 10 that are attached vertically near the edges of sliding face 27 are able to swing laterally by pivoting in a horizontal pivot joint 7,8. At their upper ends, posts 9 and 10 are connected together under elastic tension by means of horizontally-disposed elastic means 4 and transmission means 5.

Posts 9, 10 are designed preferably as rectangular pipes, whereby post 9 comprises, for example in its upper zone, an axially spring loaded centering pin 13, while post 10 features, in the corresponding upper zone, an oblong recess 14 and a deflecting profile 19.

The length of oblong recess 14 is determined by the amount of vertical offset likely to occur between two facing gangway parts 22,22' during coupling of their respective car bodies 20,20', which might result from, e.g. different axle loads in the two vehicles.

The presence of deflecting profile 19 on post 10 prevents, during the coupling of two laterally-offset car bodies, the centering pin, which protrudes from an opposing retaining-and-centering device, from catching on the side of opposing post 10.

Where gangway parts 22,22' shift relative to each other during curve travel, a centering pin 13, which, at first either rides near deflecting profile 19 or sits against the sliding face 27 of a facing gangway part, automatically slides, with the next shift of the cars, for example during curve running, into the oblong-shaped recess 14 of post 10. For this purpose, centering pin 13 is spring loaded in such a way that, when acted upon by an external axial force, it can be pushed backward at least so far as to be able to line up flush with the external contour of post 9.

Posts 9, 10 may also be embodied as a pipe whose particular shape takes over the deflecting function of deflecting profile 19, so rendering the latter superfluous.

When the two gangway parts 22, 22' are congruently aligned, centering pins 13 fit into the corresponding mating recesses 14, and posts 9, 10 are held vertically by means of elastic means 4 and transmission means 5 against the edges of the respective gangway part 22 or 22'.

When, as indicated in Fig. 4, gangway parts 22,22' shift laterally relative to each other, posts 9 of retaining-and-centering device 10 alternately assume, depending on the

direction of lateral shift, either position 9' or 10' indicated in Fig. 5.

Fig. 6 illustrates the general construction of a retaining-and-centering device 26 that also features, at the sides of sliding face 27, vertically-arranged posts 9, 10, which at their lower ends, can be swung out laterally on their respective horizontal pivot joints 7,8.

Posts 9, 10 are held under tension in their respective vertical positions on either side of cummunication device part 22 by elastic means 4 and transmission means 5.

For the purposes of this arrangement, elastic means 4 are integrated in both posts 9 and 10 and are connected to gangway part 22 via transmission means 5, which are directed, by deflecting means 6, borne for this purpose inside posts 9 and 10, into a plane that deviates from the working direction of elastic means 4.

Fig. 7 illustrates a gangway part 22 fitted with a retaining-and-centering device 28. A centering unit 13' and a recess 14' are fitted so as to be incapable of twisting, laterally in relation to gangway part 22, for example, in the upper zone of the latter, and are slidably-borne in guides 15, 16 attached to gangway part 22, and have a length corresponding to at least the transverse travel path of such gangway part. Centering unit 13' and recess 14' are, in this arrangement, connected together via transmission means 5 guided upon both a deflecting means 6 borne on gangway part 22 and upon a further deflecting means 6' that is held by elastic means 45 which is either pushing or pulling such deflection means.

In a further embodiment, centering unit 13' and recess 14' of a retaining-and-centering unit 28 as shown in Fig 1, can be held directly by elastic means 4 and by transmission means 5, in one plane.

Fig. 8 shows another embodiment of the proposed retaining-and-centering device 29, whereby posts 9, 10, which are arranged vertically on either side of sliding face 27, are designed as bending springs 17, 18 that are joined, near their middles in a stressed relationship, to gangway part 22 by means of a horizontal pivot joint 7, 8.

Posts 9, 10, which are embodied as bending springs 17, 18, assume, in the context of a proposed retaining-and-centering device 29, the function of the otherwise-employed elastic means. For this purpose, bending springs 17, 18 can be produced from a composite material comprising fibreglass or graphite layers, whose special material characteristics can be fully exploited by their being bonded in a structure.

A bending spring 17, 18 of such construction is, when unflexed, bent slightly relative to its longitudinal axis. When installed on the side of a gangway part 22, such slight bending predisposes such spring to being prestressed at its upper and lower extremities.

A bending spring 17 features, for example, on its upper end portion an axially spring-loaded centering pin 13 and on its lower end portion a recess 14, as well as a deflecting profile 19. Thus equipped, bending spring 17, which is fitted, for example, flush against the side of gangway part 22, is dynamically-balanced against an identical bending spring 18 attached flush to the left-hand side of gangway part 22.

If the number of centering pins 13 comprised by retaining-and-centering device 29 is doubled the surface pressure acting on centering pins 13 and recesses 14 of the opposing gangway part 22' can be reduced.

When gangway parts 22,22' shift laterally relative to each other as shown in Fig. 4, the tops and bottoms of bending

springs 17, 18 assume, with rising elastic force and depending on the direction of lateral shift, either position 17' or 18', shown in Fig. 8.

Further embodiments of the proposed retaining-and-centering mechanism are shown, from only one of their sides, in Figs. 9 to 12 Such embodiments feature, with respect to the guidance means for posts 9 and 10 and to elastic means 4, a wide variety of mechanical arrangements that permit optimal adaptation to different operational requirements.

Figure 9 shows one post (9), 10 of a retaining-and-centering mechanism 36 as arranged almost vertically on the side of a gangway post 22. Each post (9), 10 is fitted via a pivot joint 8 to one or more parallel but separately-mounted pushing members 34, 34'.

Pushing elements 34, 34' are borne so as to be able to slide laterally inside horizontal guides 16,16' whose length corresponds at least to that of the transverse travel path shown in Fig. 4, whereby at least one of guides 16,16' is integrated in a pivot bearing 33.

Post 10 features, for example, in its lower zone a centering pin 13 that is spring loaded in its axial direction, and in its upper zone an oblong-shaped recess 14 and a deflecting profile 19. Post 10 is held, by means of a horizontally-arranged elastic means 4, vertically against the side of gangway 22.

When gangway parts 22,22' shift laterally relative to each other as shown in Fig 4, posts (9)10 alternately assume, depending on the direction of laterial shift, either position (9'),10 as indicated in Fig. 9.

A simplified example of the guidance of a post (9), 10 arranged on the side of gangway part 22, is illustrated by a

retaining-and-centering device 37 as shown in Fig. 10. In this arrangement, the pivot bearing suggested in Fig. 9 can be omitted, if at least one of pivot joints 8,8' connecting to pushing elements 34,34' respectively is able to slide inside an oblong-shaped slot 35 provided in post (9),10.

When both gangway parts 22,22' shift laterally relative to each other as illustrated in Fig. 4, posts (9), 10 alternately assume, depending on the direction of lateral shift, position (9') or 10 shown in Fig. 10.

Fig. 11 illustrates a post (9),10 designed in accordance with Figs. 9 and 10, which is embodied as a retaining-and-centering device 38 and connected to a gangway part 22 both via elastic means 4 that are integrated in the top and bottom of such post, and via transmission means 5. Deflecting means 6, installed inside posts (9),10 serve, as demonstrated in Fig. 6, to direct transmission means 5 into a plane that deviates from the working direction of elastic means 4.

It is also possible to flexibly connect to a gangway part 22 a post 9, 10 designed as in Figs. 9 or 10, and embodied in Fig. 12 as retaining-and-centering device 39.

The provision of an axially spring-loaded centering pin 13 renders gangway part 22, which is fitted with one of proposed retaining-and-centering devices 25, 26, 28, 29, 36, 37, 38, 39, compatible not only with an identical facing part, but also with a conventional UIC-approved rubber bellows type gangway.

The proposed retaining-and-centering device distinguishes itself by being able to maintain, for as long a period as possible, two gangway parts in a floating condition relative to their respective car bodies. The second advantage of the proposed retaining-and-centering device is the capacity, aided by prestressed elastic means, to force back into a position

congruent with its opposite counterpart, a gangway part that has shifted laterally away from such opposing gangway part.

From such a congruent position, the prior art gangway, can, being held in position by the proposed retaining-and-centering device, regain its floating position between the ends of two rail cars. This floating position is maintained until the lateral slippage between two coupled rail cars exceeds a limit defined by a stop.

After the latter limit has been surpassed by lateral travel of the communication parts, the opposing gangway parts leave their congruent alignment to slide laterally relative to each other and so to automatically actuate the proposed retaining-and-centering device, which is then able to force the return of the aforesaid gangway parts into their original congruency.

The proposed retaining-and-centering device retards the lateral relative slippage, owing to lateral car-end shifting, of two facing gangway parts to such an extent that such lateral relative slippage begins only after relative car end shifting passes a point normally defined by a stopping element. The significance of this arrangement is that the gangway clearance is not reduced during running over curves, with the exception, e.g. of very tight shunting yard curves.

The proposed retaining-and-centering mechanism, by maintaining in conjunction with separated and laterally-offset gangway parts a gangway clearance that exceeds the clearance attainable with a non-floating gangway by the distance traveled by the floating portion, significantly improves comfort for the passenger wishing to cross between two rail cars.

Such gangways, being connected together in a floating relationship, give the passenger walking between two rail cars a feeling of security, due to the advantage, conferred upon

the system, that the gangway parts seldom shift relative to each other while running over open, normally-curved track. Because this condition will naturally lead the crossing-over passenger to conclude that the absence of lateral inter-car deviation is normal, he may be inclined to use the inter-car gangway for pauses while crossing from car to car.

All of the individual components and distinguishing features disclosed in the disclosure and/or figures, as well as their permutations, combinations and alternative versions, are inventive. This is especially true for n individual components and distinguishing features wherein n = 1 to n approaching ∞.